

LISTING OF CLAIMS

This listing of claims will replace all prior listings of claims in this application.

1. (CURRENTLY AMENDED) An apparatus for administering a suspendible agent in suspension, the apparatus comprising:

a suspendible agent suitable to be administered to a patient to diagnose or treat a medical condition;

a delivery container including a fluid reservoir holding a propellant fluid, an exit port, a fluid path between said fluid reservoir and said exit port, and a delivery mechanism operative for causing said propellant fluid to flow through said fluid path; and

a suspension apparatus disposed in said fluid path, said suspension apparatus defining a longitudinal axis and including a first longitudinal end in fluid communication with a second longitudinal end, and a plurality of layers disposed between said first longitudinal end and said second longitudinal end, each layer of said plurality of layers including a plurality of circumferential flow channels fluidly coupled by a plurality of radial flow channels, wherein adjacent layers of said plurality of layers are fluidly coupled by at least one axial flow channel, and wherein including a radial flow channel and a plurality of circumferential flow channels coupled in fluid communication by said radial flow channel, said radial flow channel and said plurality of circumferential flow channels capable of being filled with the suspendible agent and in fluid communication with said exit port, wherein the suspendible agent is delivered to said exit port after flowing through said plurality of radial flow channel channels and said plurality of circumferential flow channels when said delivery mechanism is operated to cause the propellant fluid to flow through said fluid path.

2. (ORIGINAL) The apparatus of claim 1 wherein said suspension apparatus further includes a plurality of circumferential dividing walls defining said plurality of circumferential flow channels.

3. (ORIGINAL) The apparatus of claim 2 wherein said suspension apparatus further includes a gap formed in a corresponding one of said plurality of circumferential dividing walls that defines said radial flow channel.

4. (PREVIOUSLY PRESENTED) An apparatus for administering a suspendible agent in suspension, the apparatus comprising:

a delivery container including a side wall extending between opposite ends of said delivery container, said delivery container including a fluid reservoir at least partially bounded by said side wall that is capable of holding a propellant fluid, an exit port, a fluid path between said fluid reservoir and said exit port, and a delivery mechanism operative for causing said propellant fluid to flow through said fluid path; and

a suspension apparatus defining at least part of said fluid path and located within said delivery container adjacent said reservoir such that said fluid path is at least partially bounded by said side wall of said delivery container, said suspension apparatus including a radial flow channel and a first plate carrying a plurality of circumferential dividing walls defining a plurality of circumferential flow channels coupled in fluid communication by said radial flow channel, said radial flow channel and said plurality of circumferential flow channels capable of being filled with the suspendible agent and in fluid communication with said exit port, wherein the suspendible agent is delivered to said exit port after flowing through said radial flow channel and said plurality of circumferential flow channels when said delivery mechanism is operated to cause the propellant fluid to flow through said fluid path, and wherein said first plate includes opposed upstream and downstream surfaces and an axial flow channel extending between said upstream and downstream surfaces, said plurality of dividing walls being distributed between said upstream and downstream surfaces.

5. (ORIGINAL) The apparatus of claim 4 wherein said first plate includes a radial dividing wall intersecting said plurality of circumferential dividing walls for blocking the plurality of circumferential flow channels and diverting fluid flow through said radial flow channel.

6. (CANCELED)

7. (PREVIOUSLY PRESENTED) The apparatus of claim 4 wherein said axial flow channel couples circumferential flow channels on said downstream surface with circumferential flow channels on said upstream surface.

8. (CANCELED)

9. (PREVIOUSLY PRESENTED) The apparatus of claim 4 wherein said axial flow channel is located adjacent to a center of said first plate.

10. (PREVIOUSLY PRESENTED) The apparatus of claim 4 wherein said axial flow channel is located adjacent to a peripheral edge of said first plate.

11. (PREVIOUSLY PRESENTED) The apparatus of claim 4 wherein said suspension apparatus further comprises a second plate contacting said plurality of dividing walls and a third plate contacting said plurality of dividing walls so that said plurality of dividing walls define said plurality of circumferential flow channels.

12. (ORIGINAL) The apparatus of claim 11 wherein said second and said third plates each includes an axial flow channel coupling said plurality of circumferential flow channels and said plurality of radial flow channels with circumferential and radial flow channels of an adjacent first plate.

13. (ORIGINAL) The apparatus of claim 4 wherein said suspension apparatus includes a second plate having an axial flow channel communicating with said plurality of circumferential flow channels, said second plate contacting said plurality of first dividing walls for defining said plurality of circumferential flow channels.

14. (PREVIOUSLY PRESENTED) The apparatus of claim 2 wherein said plurality of first dividing walls include irregularities that cause said suspendible agent flowing in said plurality of circumferential flow channels to change direction.

15. (ORIGINAL) The apparatus of claim 2 wherein said plurality of circumferential dividing walls have a concentric arrangement.

16. (ORIGINAL) The apparatus of claim 1 wherein said suspension apparatus includes a pair of first plates, said plurality of circumferential flow channels and said plurality of radial flow channels being distributed between said pair of first plates.

17. (ORIGINAL) The apparatus of claim 16 wherein said suspension apparatus includes a second plate positioned between said pair of first plates so as to separate said plurality of circumferential flow channels and said plurality of radial flow channels on an upstream surface of one of said pair of first plates from said plurality of circumferential flow channels and said plurality of radial flow channels on a downstream surface of the other of said pair of first plates.

18. (ORIGINAL) The apparatus of claim 17 wherein said second plate includes an axial flow channel coupling said plurality of circumferential flow channels and said plurality of radial flow channels on one of said first plates with said plurality of circumferential flow channels and said plurality of radial flow channels on the other of said first plates.

19. (CURRENTLY AMENDED) An apparatus for administering a suspendible agent in suspension, the apparatus comprising:

a delivery container including a fluid reservoir capable of holding a propellant fluid, an exit port, a fluid path between said fluid reservoir and said exit port, and a delivery mechanism operative for causing said propellant fluid to flow through said fluid path; and

a suspension apparatus positioned inside said delivery container and disposed in said fluid path, said suspension apparatus defining a longitudinal axis and including a first longitudinal end in fluid communication with a second longitudinal end, and a plurality of layers disposed between said first longitudinal end and said second longitudinal end, each layer of said plurality of layers including a plurality of circumferential flow channels fluidly coupled by a plurality of radial flow channels, wherein adjacent layers of said plurality of layers are fluidly coupled by at least one axial flow channel including a radial flow channel and a plurality of circumferential flow channels coupled in fluid communication by said radial flow channel, said radial flow channel and said plurality of circumferential flow channels capable of being filled with the suspendible agent and in fluid communication with said exit port, wherein the suspendible agent is delivered to said exit port after flowing through said radial flow channel and said plurality of circumferential flow channels when said delivery mechanism is operated to cause the propellant fluid to flow through said fluid path.

20. (ORIGINAL) The apparatus of claim 1 wherein said circumferential flow channels have a concentric arrangement.

21. (CURRENTLY AMENDED) An apparatus for administering a suspendible contrast agent in suspension, the apparatus comprising:

a delivery container including a fluid reservoir holding a propellant fluid, an exit port that is sized and configured for delivery of said suspendible contrast agent from said delivery container to a patient's body, a fluid path between said fluid reservoir and said exit port, and a delivery mechanism operative for causing said propellant fluid to flow through said fluid path; and

a suspension apparatus defining a longitudinal axis disposed in said fluid path, said suspension apparatus including a plurality of pairs of first and second plates with a stacked arrangement, each pair of said plurality of pairs of first and second plates being separated from adjacent pairs by a plurality of dividing walls defining a plurality of circumferential flow channels fluidly coupled by a plurality of radial flow channels capable of being filled with the contrast agent, each pair of said plurality of pairs of first and second plates configured to permit axial flow between said plurality of circumferential flow channels of adjacent pairs of first and second plates, wherein the contrast agent is delivered to said exit port after flowing through said plurality of circumferential flow channels fluidly coupled by said plurality of radial flow channels when said delivery mechanism is operated to cause propellant fluid to flow through said fluid path.

22. (CURRENTLY AMENDED) The apparatus of claim 21 wherein a ratio of a volume of said plurality of circumferential flow channels to a volume occupied by said plurality of dividing walls ranges from about 0.25 to about 0.5.

23. (CANCELLED).

24. (PREVIOUSLY PRESENTED) The apparatus of claim 21 wherein each of said pairs of first and second plates includes an axial flow channel to permit axial flow between adjacent sets of flow channels.

25. (ORIGINAL) The apparatus of claim 21 wherein said suspension device is positioned inside said delivery container.

26-34. (CANCELED)

35. (PREVIOUSLY PRESENTED) An apparatus for administering a suspendible agent in suspension, comprising:

a suspendible agent suitable to be administered to a patient to diagnose or treat a medical condition;

a delivery container including a fluid reservoir capable of holding a propellant fluid, an exit port, a fluid path between said fluid reservoir and said exit port, and a delivery mechanism operative for causing said propellant fluid to flow through said fluid path; and

a suspension apparatus disposed in said fluid path, said suspension apparatus including a radial flow channel and a plurality of circumferential flow channels coupled in fluid communication by said radial flow channel, said radial flow channel and said plurality of circumferential flow channels capable of being filled with the suspendible agent and in fluid communication with said exit port, wherein the suspendible agent is delivered to said exit port when said delivery mechanism is operated to cause the propellant fluid to flow through said fluid path.

36. (PREVIOUSLY PRESENTED) The apparatus of claim 35 further comprising a delivery component connected to said exit port that provides a delivery passageway between said delivery container and a patient's body such that said suspendible agent is delivered from said exit port to said patient's body.

37. (PREVIOUSLY PRESENTED) The apparatus of claim 36 in the form of a syringe, the delivery container comprising a barrel of the syringe, the suspension apparatus located in the barrel.

38. (PREVIOUSLY PRESENTED) The apparatus of claim 35 wherein the suspendible agent is a suspendible contrast agent.

39. (PREVIOUSLY PRESENTED) The apparatus of claim 4 in the form of a syringe, the delivery container comprising a barrel of the syringe, the suspension apparatus and reservoir located in the barrel.

40. (PREVIOUSLY PRESENTED) The apparatus of claim 21 wherein said propellant fluid is of a different composition than the contrast agent.

41. (NEW) A syringe comprising

a barrel having a first end and a second end, said first end including an exit port;

a plunger slideably and sealingly received in said second end to define a fluid reservoir within said barrel; and

a suspension apparatus disposed in a fluid path between said fluid reservoir and said exit port, said suspension apparatus defining a longitudinal axis and including a first longitudinal end in fluid communication with a second longitudinal end, and a plurality of layers disposed between said first longitudinal end and said second longitudinal end, each layer of said plurality of layers including a plurality of circumferential flow channels fluidly coupled by a plurality of radial flow channels, wherein adjacent layers of said plurality of layers are fluidly coupled by at least one axial flow channel.